An Overview of Salmon Habitat and Restoration Related Activities in Canada and the United States 1999 – 2006

A Report of the Pacific Salmon Commission prepared by the Ad Hoc Habitat Scoping Committee

January 2008

Pacific Salmon Commission Technical Report No. 24

The Pacific Salmon Commission is charged with the implementation of the Pacific Salmon Treaty, which was signed by Canada and the United States in 1985. The focus of the agreement are salmon stocks that originate in one country and are subject to interception by the other country. The objectives of the Treaty are to 1) conserve the five species of Pacific salmon in order to achieve optimum production, and 2) to divide the harvests so each country reaps the benefits of its investment in salmon management.

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1. Introduction

The 1999 Pacific Salmon Treaty Agreement between the governments of the United States and Canada includes a comprehensive set of revised fishing arrangements that replaced regimes contained in Chapters 1- 6 of Annex IV of the Treaty which had expired. In addition to these new fishing regimes, the 1999 Agreement contains provisions that recognize the critical role that habitat plays with regard to the restoration of depressed salmon stocks and the maintenance of healthy stocks. In particular, Attachment E to the 1999 Agreement calls upon the governments of the United States and Canada (the "Parties") to use their best efforts, consistent with applicable law, to protect and restore habitat, maintain and improve safe passage of salmon to and from their natal streams, and maintain adequate water quality and quantity.

To promote these objectives, the Pacific Salmon Commission was tasked to report to the Parties regarding, among other things, which natural spawning stocks subject to the Treaty can not be restored to optimum production using harvest controls alone and the progress of the Parties' efforts to address the non-fishing factors affecting those stocks. In addition, Attachment C to the 1999 Agreement established two endowment funds to fund projects to improve fishery management, protect and restore habitat, and enhance natural spawning stocks. In essence, these provisions of the 1999 Agreement represent a recognition by the Parties that fisheries management under the PST, although making substantial contributions to coastwide salmon conservation, can not alone achieve the conservation and optimum production goals of the Pacific Salmon Treaty. Significant and sustained efforts are necessary to protect and restore salmon habitat, improve fish passage, and provide adequate water quality and quantity to support the optimum production of naturally spawning stocks subject to the Treaty.

In 2007, the Commission tasked an Ad Hoc Habitat Scoping Committee to prepare a report on the salmon habitat activities carried out by Canada and the U.S. since 1999. This report provides a high-level overview of the large number of programs, projects and habitat restoration activities undertaken in Canada and the United States to improve the status of some natural spawning stocks for which harvest controls alone cannot achieve optimum production. Examples of habitat projects in the primary categories are provided as well as an overview of the various regulatory landscapes within which programs and projects are implemented.

The Commission also tasked the Ad Hoc Habitat Scoping Committee to further define the charter and the funding of a Habitat and Restoration Technical Committee (HRTC). This Committee will report in subsequent years to the Commission on the status of naturally spawning stocks subject to the Treaty for which non-fishing factors are limiting production, on the non-fishing factors that limit production of specific stocks, and on options to address habitat factors. The HRTC will also facilitate the exchange between the parties of information and best practices associated with habitat protection and restoration.

This report, *An Overview of Salmon Habitat and Restoration Related Activities in Canada and the United States 1999 – 2006,* has been prepared by the Pacific Salmon Commission as the first step in reporting to the Parties pursuant to Attachment E to the 1999 Agreement. Future annual reports that address the specific provisions of Paragraphs 1 and 2 of Attachment E will be a charge of the Habitat and Restoration Technical committee as established and funded by the Commission.

2. Summary of Salmon Habitat Restoration Activities (1999-2006)

Salmon are emblematic of the Pacific Northwest and salmon habitat restoration has found support in almost every community throughout this vast region. Thousands of projects to improve salmon habitats have been completed or are underway in Canada and the United States. These projects involve an extensive network of volunteers, organizations and agencies and are supported by national, regional and local governments; Tribal and First Nation entities; and a variety of non-governmental organizations. The Northern and Southern Restoration and Enhancement Funds were created as endowments under the 1999 PST Agreement. Since 2004, over $5.3 million in earnings of these funds has been utilized for salmon habitat projects in Southeast Alaska, southern Yukon Territory, British Columbia, and the Pacific Northwest. Another endowment fund, the Yukon River Salmon Restoration and Enhancement Fund, has invested in habitat related projects in the Yukon River drainage in Alaska and the Yukon Territory. While these bilateral funds provide a substantial and growing contribution to salmon habitat protection and restoration, both the United States and Canada have other very significant salmon restoration and conservation funding, some of which is described below.

In the United States, the Pacific Coastal Salmon Recovery Fund (PCSRF) was established in 2000 to support the restoration and conservation of Pacific Salmon (of which many stocks in the Pacific Northwest have been listed under the Endangered Species Act) and their habitat. Through Fiscal Year 2006, $525M has been appropriated to the states of Washington, Oregon, Alaska, California, Idaho and to the Pacific Coast and Columbia River tribes for restoration and conservation activities consistent with the goals of the program. Over 5,700 PCSRF projects have been funded to date with over 3,000 projects focusing on habitat restoration projects and 1,300 projects focusing on watershed/species assessments and subbasin planning. In addition to on the ground habitat work, much of the PCSRF funding in Alaska is being utilized for assessment, monitoring and management programs to provide critical information that will help ensure that practices that have resulted in habitat degradation and depressed salmon stocks in other jurisdictions are avoided in Alaska.

Significant funds have also been provided to Pacific Northwest States and Tribes through the Northwest Power Conservation Council, US Fish and Wildlife Foundation and state legislatures. In Washington, from 1997 to 2005 $590M was appropriated for salmon recovery habitat-related initiatives. Oregon has established, by initiative, a dedicated State Lottery account to fund restoration efforts. From 1995 to 2005, the total funding for Oregon's restoration and protection projects exceeded $388M. Idaho began receiving PCSRF funds in 2004, from 2004 to 2006, $11.5 M was appropriated for salmon recovery habitat-related initiatives. To ensure effective use of these funds, NOAA Fisheries has partnered with the Pacific Northwest states and Tribes to develop recovery plans, support local watershed efforts and help provide direction for funding based on the identification of limiting factors and the prioritizing of strategic actions to address those factors. Federal and state funds are augmented by significant resources from local governments, non-governmental organizations, and a range of stakeholders.

In Canada there have been many funding sources for salmon habitat restoration activities. The Habitat Restoration and Salmon Enhancement Program funded over 550 habitat restoration, stewardship, and stock rebuilding projects, those from 1999 forward are reported here. The Pacific Salmon Endowment Fund is managed by the Pacific Salmon Foundation. Since 1989, the Pacific Salmon Foundation has supported over 790 community salmon projects. Most Yukon salmon habitat restoration projects reported were funded by the Yukon River Panel's Restoration and Enhancement Fund. Other large funding programs include Forest Renewal BC, Fisheries Renewal BC, the Urban Salmon Habitat Program, the Living Rivers Program and Habitat Conservation Trust Fund. It should be noted that these are just a few of the major funding sources, and significant resources from hundreds of local governments, First Nations, non-government organizations and other stakeholders have also contributed to salmon restoration projects.

About the data in this report

The numbers reported below represent restoration and conservation activities completed or underway for salmon stocks in Alaska, British Columbia, Oregon, Washington and the Yukon. The level of detail reported and the number of projects reported was limited by what is currently captured in agency information systems. Unless otherwise noted, US data are cumulative numbers reflecting PCSRF funded projects from 2000 - federal fiscal year 2006 (ended September 2006.) Oregon and Washington, where noted have provided further detailed information from their in-state databases used to develop the Washington State of the Salmon report and the Oregon Plan for Salmon and Watersheds Biennial Report. Tribal projects are included within the geographic regional breakdown and not identified separately. Tribes in Oregon and Washington are partners on projects in almost every watershed both in providing direct PCSRF tribal funding as well as partnering on state and local PSCRF projects.

All Canadian project numbers were taken from the Fisheries Project Registry (FPR) which tracks data about specific categories of fisheries-related projects. The FPR is used by all major funding agencies to share information on their projects with other parties and the public. Data includes the project name, objectives and description, the lead proponent, sponsoring agency and project contacts, the activity type, start date and status, and location.

This report focuses on planning and restoration projects and actions, but does not include actions resulting from acquisition, compensation (Canadian terminology) and mitigation (U.S. terminology) requirements.

Additional detail concerning U.S. habitat restoration projects is derived from the databases maintained for annual PCSRF and state performance reports and provided after each summary table.

Case studies are provided for each category to demonstrate the type of work involved.

2.1 Instream Habitat Projects

Biological requirements for salmon vary depending on life stage. Adults, during spawning migrations, require clean, cool water, adequate flows and sufficient holding and resting areas to successfully reach spawning areas. Egg and fry survival depend on in-stream conditions such as gravel size, oxygen concentrations, level of fine sediments, substrate stability during high flows, and water temperatures. Habitat requirements for juvenile rearing include microhabitats for holding, feeding and resting. While migration of juveniles to rearing areas requires access to these important habitats, there are physical, chemical and temperature conditions that may impede the movements of adult or juvenile fish.

In-stream habitat in many Pacific Northwest streams has been significantly altered, limiting the ability to provide productive salmon habitat. In-stream habitat restoration projects are focusing on increasing or improving the physical conditions within the stream environment (below the ordinary high water mark of the stream) to restore and maintain the capacity to support productive, self-sustaining salmon populations. Projects include activities involved with bank stabilization, nutrient enhancement, (e.g. carcass placement), channel connectivity, channel reconfiguration, deflectors/barbs, log control (weir), off-channel habitat wetland, plant removal/control, rock control (weir), roughened channel, signage, site maintenance, spawning gravel placement, woody debris placement, and stream channels.

Instream Habitat Projects	Number of Projects
Canada	
British Columbia	582
Yukon	5
United States	
Alaska	11
Idaho	7
Oregon (includes Tribes)	661*
Washington (includes Tribes)	406**

In the United States, 14 stream miles in Alaska, 12 stream miles in Idaho, 646 *stream miles in Oregon, 494 stream miles in Washington have been treated to improve habitat for salmon.

*Oregon Watershed Restoration Inventory (OWRI)

**Washington Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP)

In-stream Habitat Project Case Studies

Kelley Creek Confluence Restoration, Oregon State

The Alsop-Brownwood area encompasses approximately 57 acres of open space land at the confluence of Johnson and Kelley creeks. Numerous residential properties were purchased in this area through the Portland Bureau of Environmental Service's Willing Seller Land Acquisition Program. Once properties were acquired, the existing structures were removed and the sites were banked for future restoration. The Johnson Creek Restoration Plan identified the Alsop-Brownwood Site as one of the highest priorities for implementation.

Kelley Creek Main Channel - Before

The Kelley Creek Confluence Restoration Project is the first phase of restoration within the larger Alsop-Brownwood Site, and is the first project from the Johnson Creek Restoration Plan to be funded. The reach of Kelley Creek immediately upstream of the confluence, and below the SE 159th Ave Bridge, is the main focus of the project; it was armored with stone walls constructed by the Works Progress Administration during the 1920s and 1930s. Instream conditions in this reach included a lack of large woody debris and channel complexity, channel incision, and a substrate with a fairly even distribution of particle sizes. Upstream of the restoration area the channel is naturally constrained by alternating terraces and hill slopes with a more intact riparian zone. This section of the creek has more channel complexity, and species such as steelhead, rainbow trout, cutthroat trout and

lamprey have been found here. The primary goal of the project is to provide habitat for salmonid recovery consistent with the City of Portland's ESA strategy. Other goals include the provision of flood storage and improvement in water quality.

Kelley Creek - After (OWEB)

This project relocated lower Kelley Creek into a new meandering channel with pool and riffle habitat. Approximately 24,000 cubic yards of soil were excavated from the floodplains of Kelley and Johnson creeks to construct two backwater channels and the new meandering channel for Kelley Creek. A total of 13.6 acre-feet of additional floodwater storage was created. Partners included the City, Oregon Watershed Enhancement Board, National Oceanic and Atmospheric Administration, and Oregon Department of Environmental Quality.

The creation of the two backwater channels along Johnson Creek provided immediate beneficial wetland habitat, floodwater storage, and high-flow refuge for fish. In addition, riparian and upland vegetation planted in the backwater areas, new channel, and floodplain provided habitat for wildlife. Re-meandering of Kelley Creek has provided immediate beneficial cold water spawning and rearing habitat for fish as well as capacity for flood storage. The former channel of Kelley Creek was 368 feet long, and now is 573 feet long adding 205 feet of cold water spawning and rearing habitat. The project also reduced the slope of the creek from about 1.5 percent to less than one percent to provide ideal spawning habitat.

Lower Mayo River Chinook Habitat Restoration Project, Yukon Territory

A reduction in secondary channels associated with a dam constructed in 1952 was thought to have decreased rearing and overwintering opportunities for juvenile Chinook salmon. In 2004 the Yukon River Panel of the Pacific Salmon Treaty supported a project to create high quality rearing habitat for juvenile chinook through the Yukon River Restoration and Enhancement Fund. A side channel and a groundwater channel were both improved by deepening them and adding fish habitat features.

Mayo Backchannel - Before

Preliminary biological results indicated extensive use of the side channel by juvenile chinook and confirmed its importance during both high and low flows, and during the winter months. The physical assessment revealed that the channel experienced considerable physical adjustments in the year after restoration works and then stabilized. Excavation of the groundwater channel intercepted an oxygen-deficient aquifer, resulting in limited use by juveniles. Monitoring of both channels continues.

Mayo Backchannel - After

2.2 Estuarine Habitat Projects

Properly functioning estuaries are essential for healthy salmon populations. Providing the interface between freshwater and open marine waters, estuaries are where juveniles and adults undergo the important physiological changes needed as they transition to and from saltwater. Estuaries are nurseries for both juvenile salmon and the forage fish that they need for food as they become adults. Properly functioning estuaries provide high quality growth conditions as well as refuge from floods and predators.

Successful estuarine projects result in an improvement of the quality or an increase in the availability of habitat through efforts such as tidal channel restoration, floodplain connectivity, floodgate fish passage or removal of barriers to re-establish estuary function in areas where lands have been diked and drained.

Estuarine habitat projects	Number of Projects
Canada	
British Columbia	12
Yukon	0
United States	
Alaska	2
Idaho	N/A
Oregon (includes Tribes)	17*
Washington (includes Tribes)	71

In the United States, in Alaska 10 acres, in Oregon 408* acres, and in Washington 4,337 acres of estuarine habitat have been restored to improve habitat conditions for salmon. In Oregon 97 acres and in Washington 1,102 acres of estuary have been treated for invasive species that reduce the quality of salmon habitat. *Oregon Watershed Restoration Inventory (OWRI)

Estuarine Habitat Project Case Studies

Baikie Island Backchannels, Campbell River Estuary, British Columbia

For the last sixty years, industrial activities, including forestry and hydroelectric development, have negatively impacted the habitats of the Campbell River Estuary. The Campbell River supports coho, chum, chinook, sockeye, and pink salmon, steelhead and cutthroat trout, lamprey, and Dolly Varden. The estuary is an important rearing area for juvenile chum and chinook salmon which reside in the estuary for 90 and 60 days respectively. Backchannel and marsh habitats were identified as limiting production.

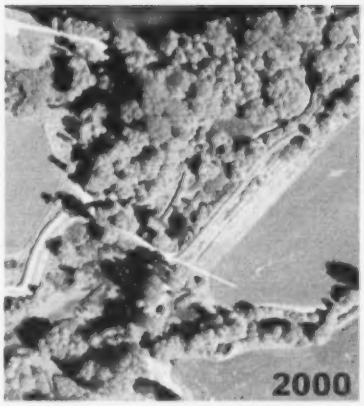
Baikie Island - Before

In 2005 new backchannel and a marsh bench were created as part of the Campbell River estuary Restoration Plan. 7,200 m² of marsh, 1,817 m² of riparian, and 1,480 m² of sub-tidal habitats were created and 6,300 m² were planted with trees and other upland species. The work was undertaken by the Greenways Land Trust with financial support from the BC Hydro Bridge Coastal Fish and Wildlife Restoration Program, the Pacific Salmon Foundation, the Nature Conservancy of Canada, BC Hydro Re-greening, and the City of Campbell River.

Baikie Island - After

Skagit River Estuary Restoration at Deepwater Slough, Washington State

Due to the diking and draining of the Skagit River delta to support farming and population growth, 75 percent of the Skagit Valley's historic estuaries have been lost. The Skagit System Cooperative (SSC) estimated that a properly functioning estuary could boost Skagit River Chinook adult returns by as many as 80,000 fish annually.



In September 2000, approximately 221 acres of the South Fork Skagit River delta were restored to tidal and riverine flooding through the removal of dikes that had isolated the site from adjacent tidal wetlands. The Deepwater Slough project, completed by Skagit System Cooperative (SSC), the Washington Department of Fish and Wildlife and the U.S. Army Corps of Engineers, was one of the largest dike removal programs in North America. The project removed 2.77 miles of dike - benefiting the estuary as well as restoring functionality to the neighboring nearshore environment.

SSC was responsible for the monitoring the project's progress, which three years later was already showing improvements. Native vegetation started to reestablish itself immediately and was being used by fish and birds within 2 years. Effectiveness monitoring found that juvenile salmon colonized the restored habitat in the slough within a year of the project's completion and were present at similar levels found at other locations in the estuary. SSC modeling of the 221 acres restored by the Deepwater Slough project estimate 93,000-107,000 new Chinook smolts each year. Estimated returning adults due to the increased smolt production could yield as few as 100 adults under very poor marine conditions or has high as 1,625 adults under more favorable conditions.

Deepwater slough upstream of upper dike (at the end of arrow.) The channel upstream has widened from 2.8m in 2000 to 7.9m in 2002. Projected to ultimately reach its historic 80m width.

2.3 Riparian and Wetland Habitat Projects

Riparian habitat - the zone that runs along the margins of streams - performs a number of important functions such as providing shade, moderating stream temperature, stabilizing banks, controlling sediment input, providing nutrients, and contributing large woody debris which increases stream complexity by creating backwater areas and increasing the depth of pools.

Riparian projects change areas above the ordinary high water mark of the stream and within the flood plain of streams in order to improve the environmental conditions necessary to sustain salmonids throughout their life cycle. Projects include activities such as planting, fencing, livestock exclusion, water gap development, conservation grazing management, irrigation practice improvement, livestock water development and weed control.

Wetlands play an important role in providing productive salmonid habitat. Wetlands reduce peak flows in streams during high flow events reducing flooding and in-stream scouring of redds. Wetlands provide a place where water can slow down and allow sediment to settle before it reaches the stream. Wetlands also store water during wetter months which improves both in-stream flow and water temperature by releasing cool ground water into the stream in the warmer summer months. Both coho and steelhead utilize wetlands for important over-wintering rearing habitat. Juvenile salmonids, especially, can benefit from access to connected wetland areas where conditions provide food supply, protection from high flows and protection from predators.

Wetland projects are designed to protect, create or improve connected wetland areas that are known to support salmonid production.

Riparian/Wetland Habitat projects	Number of Projects
Canada	
British Columbia	481
Yukon	3
United States	
Alaska	9
Idaho	22
Oregon (includes Tribes)	2719*
Washington (includes Tribes)	1319**

In Alaska 2.2 miles and 2 acres of riparian habitat and 3,877 acres of wetland habitat were treated; in Idaho 55 miles and 728 acres of riparian habitat and 1.1 acres treated for invasive species; in Oregon 2,009* miles and 26,224*acres of riparian habitat were treated, 2,070* acres of new wetlands were created and 9,613* acres of wetlands were treated; in Washington 429 miles and 3,843 acres of riparian habitat were treated, 43 acres of new wetlands were created and 399 acres of wetlands were treated. In Oregon 1,021 miles* of riparian habitat and 56 acres* of wetlands were treated for invasive species; in Washington 7,915 acres of riparian habitat and 17 acres of wetlands were treated for invasive species.

*Oregon Watershed Restoration Inventory (OWRI)

**Washington Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP)

Riparian and Wetland Habitat Project Case Studies

Exclusion of Livestock from the Shuswap River, British Columbia

Trampling of stream banks by cattle results in wider, shallower stream channels, especially in the areas of heavy congregation. In early spring and late summer, the riparian area is often greener than the pasture areas, which attracts high cattle densities where they cause the most damage. On this site, cattle had caused damage to the streambed and banks, sedimentation, reduced oxygen in the water and impacted riparian vegetation. It also happened to contain the lower end of the most heavily used spawning habitat of the Shuswap River and a small tributary that juvenile chinook, coho and rainbow trout used for rearing.

Shuswap River - Before

In 2006, the BC Hydro Bridge Coastal Fish and Wildlife Restoration Program and the PSC funded installation of four kilometers of riparian fencing which closely followed the meanderings of the creek. Five livestock crossing/water access points were built and were gated so they could be used to move cattle between fields or be closed to allow access to water from just one side. These access points were armored with blast rock to reduce erosion and sedimentation by cattle use. Excluding cattle from the riparian area will enable riparian vegetation to re-establish to provide shade, leaf litter, woody debris and cover for salmonids.

Shuswap River - After

Wallowa River/McDaniel Habitat Restoration, Oregon State

The McDaniel project aimed to restore degraded riparian and floodplain habitats, improve habitat diversity, and improve water quality for Endangered Species Act-listed steelhead and spring Chinook salmon near Lostine in Wallowa County. Before the project, this 0.34-mile reach of the Wallowa River was reduced to a steep, narrow channel at the base of a slope along the eastern edge of the natural floodplain. In various attempts to control the river since the early 1900s, the river channel was relocated to the base of the hill and locked into place with artificial dikes. The resulting channel lacked habitat structure beneficial to salmonids.

McDaniel Habitat Restoration - Before

Partners in the project included the landowner, Oregon Department of Fish and Wildlife , Confederated Tribes of the Umatilla Indian Reservation, Wallowa Resources, Oregon Watershed Enhancement Board (OWEB), Bonneville Power Administration, USDA Natural Resources Conservation Service, Grande Ronde Model Watershed, and various foundations and volunteers.

The first step was to reconstruct one half mile of stream to simulate the historical stream channel. In July of 2005, partners began excavation to re-establish historic channel characteristics. Hopkins Forestry excavated, separated, and stockpiled the topsoil and 29,000 cubic yards of gravel and dirt material over the half mile reconstructed channel. Eight rock grade-control structures were constructed in the new reach to prevent channel downcutting until vegetation could provide channel stability. Floodplain ponds were constructed for off-stream fish habitat. Six log and rootwad revetments were placed in the new stream reach to stabilize meander bends. Most of the channel reconstruction work was completed by fall of 2005.

McDaniel Habitat Restoration - After

During fall and winter of 2005, local contractors, high school students, and ODFW staff began a revegetation project that involved transplanting more than 7,000 sedge plugs, 5,000 willow cuttings, and several hundred trees (5-10 years old), and distributing over 100 pounds of riparian seed mix.

This project was awarded the Oregon Land Board 2005 Stream Project Award. Success was evident soon after implementation. Adult Chinook and steelhead used the newly-created channel habitat for spawning the very first year water was transferred into the new stream channel. The streamside floodplain is benefiting from natural vegetation recovery. Instream fish habitat has improved as well because of the restoration of complex pool habitat. These improvements will restore historical spawning and rearing habitat, increase the water storage capacity of adjacent meadows, and improve water quality. In addition to steelhead and Chinook, many other species of wildlife, such as neotropical birds and big game, will also benefit.

2.4 Upland Habitat Projects

Upland habitat has important indirect impacts on the water quality, quantity and productivity of in-stream salmonid habitat. Upland habitat can affect the timing and delivery of water run off into streams, the amount of sediment delivered, and other water quality characteristics important to salmonids – temperature, toxins, etc.

Upland habitat projects are landscape level projects implemented above the floodplain elevation that indirectly affect salmonid habitat, for example by affecting water quality and quantity. Upland treatments include road stream crossing improvements, road drainage system improvements, road reconstruction, road obliteration, upland erosion control such as sediment control basins, windbreaks, planting as well as conservation land management such as no till agriculture and terracing.

Upland habitat projects	Number of Projects
Canada	
British Columbia	149
Yukon	1
United States	
Alaska	6
Idaho	10
Oregon (includes Tribes)	751* Upland and 2503 Road projects
Washington (includes Tribes)	372**

In Alaska 54 miles of road; in Idaho 107 miles of road and 2,512 acres of uplands, in Oregon 3,376 miles* of road and 419,292 acres* of uplands; and in Washington 323 miles of road and 12,404 acres of uplands have been treated to improve habitat for salmon.

*Oregon Watershed Restoration Inventory (OWRI)

**Washington Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP)

Upland Habitat Projects Case Studies

Stoltz Slide Remediation, Cowichan River, British Columbia

The Cowichan River has significant salmon resources but it has experienced widespread habitat impacts associated with expanding urban growth and industrial development over the last 100 years. Changes in the river's flood plain and hydrology increased bank instability, erosion, bedload movement and sedimentation. An evaluation of sediment sources was undertaken in 2005 which identified that the Stoltz slide contributed 10,000 to 28,000 m^3 of sand and silt annually to the Cowichan River. Salmon egg to fry survival rates were low in the lower river below Stoltz (0.7 to 6.8%) and high above the slide (mean of 86%).

In 2006 significant construction and bioremediation works were undertaken to stabilize the slide preventing sediment from entering the river. A new channel was excavated south of the existing meander bend to reduce erosion at the toe of the bluff. Two gradient control riffles were constructed at the top and bottom of the new channel. "Bendway weirs" were constructed to keep the river's thalweg away from the toe of a new terrace. Above the terrace rip rap, willow plants and cuttings were planted to provide erosion protection. Ongoing monitoring and maintenance of the constructed, bioengineering works will occur to evaluate whether additional upslope stabilization measures are needed and to evaluate the success of these techniques in the long term.

Funding was provided by the Georgia Basin Living Rivers Program, Pacific Salmon Commission Southern Endowment Fund, BC Ministry of Transportation, Habitat Conservation Trust Fund, TimberWest Forest Ltd., Catalyst Paper Corp., and Nilex Inc. The project was supported by the Cowichan Stewardship Roundtable.

Stoltz Slide Remediation - After

Road Maintenance and Abandonment, Washington State

Small forest landowners own 4.2 million acres of Washington's forests—about half the private forest land in the state. These lands are interlaced with thousands of miles of forest roads, many of which require frequent maintenance. Forest roads can impact public resources, such as water quality and fish habitat. Sediment (dirt and mud) from forest roads can degrade water quality. Culverts and other forms of stream crossings can also become barriers to fish, preventing them from reaching upstream habitat.

Through its forest practices rules, Washington State has created forest road maintenance requirements that minimize the effects of roads on water quality. As of May 2001, every forest owner was required to examine and prepare a road maintenance and abandonment plan (RMAP) for roads on their property.
Landowners had five years to complete roadwork planning and 15 years to complete the actual roadwork. The program focused on removing fish passage barriers, maintaining forest roads to prevent silt from fouling streams, and abandoning and restoring unnecessary roads.
These projects have been funded directly by private landowners as well as through state and federal funds available through the Family Forest Fish Passage Program which provides 75% to 100% of the cost of correcting fish barriers to private landowners to correct fish passage problems.

Since 2001, the program has reopened 982 miles of fish bearing streams by removing 1,819 barriers. Approximately 2,068 miles of forest roads have been trenched and water barred to prevent erosion and silt pollution.

Road abandonment and restoration projects Washington

2.5 Fish Passage Projects

Salmon need access to spawning and rearing habitat as well as good migration routes to and from the ocean. Unnatural physical barriers impede adult and juvenile passage in many streams, reducing productivity and eliminating some populations. Barriers may cause poor water quality (elevated temperature or low dissolved oxygen levels) and unnatural sediment deposition. Fish barriers are caused by dams, culverts, tide gates, dikes and other in-stream structures.

Fish passage projects include projects that affect or provide fish migration up and down stream including road crossings (bridges or culverts), barriers (dams or log jams), fishways (ladders, chutes or pools), and weirs (log or rock). Barriers may be complete or partial.

Unscreened or inadequately screened water diversions are also serious sources of salmonid mortality or injury. It is important that water diversions have the appropriate mesh size small enough to exclude small fish and that the approach velocity at the screen isn't stronger than the swimming ability of the fish such that it becomes entrapped on the screen.

Screening projects are projects that result in the installation or improvement of screening systems that prevent salmonids from passing into areas that do not support salmonid survival, for example into irrigation diversion channels.

Fish Passage projects	Number of Projects
Canada	
British Columbia	378
Yukon	30
United States	
Alaska	11
Idaho	33
Oregon (includes Tribes)	314
Washington	858**
Columbia River Tribes	22
Pacific Coast Tribes	33

In Alaska 482 barriers to fish passage were corrected; 36 miles of habitat was made accessible to fish through steam crossing improvements; in Idaho 83 barriers to fish passage were corrected; 696 miles of habitat was made accessible to fish through steam crossing improvements, 5 fish screens were installed to prevent fish from entering irrigation channels and other areas of unsuitable habitat; in Oregon 1,580* barriers to fish passage were corrected; 2,377* miles of habitat was made accessible to fish through steam crossing improvements, 518* fish screens were installed to prevent fish from entering irrigation channels and other areas of unsuitable habitat; in Washington 2,414** barriers to fish passage were corrected; 2,528** miles of habitat was made accessible to fish through steam crossing improvements, 445 fish screens were installed to prevent fish from entering irrigation channels and other areas of unsuitable habitat.

*Oregon Watershed Restoration Inventory (OWRI)

**Washington Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP)

Fish Passage Project Case Studies

Improvement of Cable Car Creek Culvert, British Columbia

In 2004, the BC Ministry of Transportation and Highways, with in-kind support from Fisheries and Oceans Canada (DFO) replaced a conventional corrugated pipe culvert that had impeded fish passage since 1958. Cable Car Creek, a tributary to the Kitimat River, supports coho and pink salmon, cutthroat and steelhead trout and Dolly Varden. Replacing the culvert with an open bottom culvert allowed fish to access three kilometers of good quality spawning and rearing habitat. Adult pink salmon were observed upstream of the culvert only two weeks following installation of the new structure, confirming its success. Similar upgrades to passage occurred on Grelson and Agnes Creeks in the same year, allowing access to

a total of nine kilometers. The Ministry of Transportation has also incorporated fish protection in their road maintenance and construction programs.

The Goldsborough Dam Salmon Restoration Project, Washington State

The Goldsborough Dam was built in 1921 by the Shelton Power and Light Company to supply hydroelectric power to the city of Shelton and later used to supply water to mills on the Shelton waterfront. While the dam itself was only 14 feet tall, water flowing over it had eroded the streambed, creating a 31-foot drop that had made the existing fishway inadequate, despite repeated efforts to improve it.

Goldsborough Dam Before Removal

A public-private partnership between the dam's owner, Simpson Investment Company and the state and federal government raised $4.8 million dollars for the dam removal and stream restoration project. Project partners included: the U.S. Army Corps of Engineers, the Washington Department of Fish and Wildlife, Simpson Timber Co., Squaxin Island Tribe, the U.S. Fish and Wildlife Service, the Southwest Puget Sound Watershed Council, the South Puget Sound Salmon Enhancement Group, the City of Shelton and Mason County.

Central to the project was removal of the aging wooden dam that partially blocks fish passage on Goldsborough Creek. In 2001, contractors built a bypass for the stream, removed the dam and recontoured over more than 2,000 feet of stream channel. Reconstructing the stream channel included installation of 36 weirs (acting as "steps") in the streambed to create a stairway of water for fish migration and installation of gravel and large woody debris throughout. The project opened up 14 miles of ideal spawning and rearing habitat to salmon and sea-running trout. By fall, water was directed into the new streambed and fish were observed in the weirs within days.

Goldsborough Creek After Project

Within 2 years the Squaxin Tribe reported hundreds of salmon spawning in the reopened habitat above the dam and reported 15,000 young chum passing through the reconstructed stream. The Squaxin Tribe stopped planting fish above the dam site after the dam was removed yet they report more juvenile salmon are migrating out of the system than before dam removal. In 2007, the Tribe reported that 41,200 out of 42,172 coho leaving the creek came from above the old dam site.

2.6 Watershed Plans, Sub-Basin Plans and Assessment Projects

To ensure restoration funds are invested in priority projects that are addressing the right limiting factors, watershed, sub-basin and recovery plans have been developed. Locally developed with scientific review and guidance, these plans focus efforts and funds on restoration priorities.

Watershed plans, sub-basin plans and assessment projects are projects that assess current or baseline habitat conditions and or prioritize factors limiting native salmonid production, such as amount of freshwater flow, and address measures needed to eliminate limiting factors. Types of reports include recovery plans, watershed plans, subbasin plans and habitat inventory reports, and Tribal Resource Management Plans. Projects can include recovery planning and participation in NMFS Technical Recovery Teams, watershed assessments, including mapping/inventory for plans, subbasin planning, development of habitat inventory reports, support for watershed councils and organizational infrastructure and staffing for local conservation groups and tribal entities.

The *Oregon Plan for Salmon and Watersheds* seeks to restore salmon runs, improve water quality, and achieve healthy watersheds and strong communities throughout the state. ESA recovery plans are under development with local stakeholders for listed ESUs in Oregon. Washington has submitted six locally developed recovery plans to NOAA-Fisheries covering the listed ESUs throughout the state and these have been adopted by the federal government. All of the plans are watershed-based and developed under the guidance of regional boards with local communities, Tribes, state and federal agencies.

Some examples from Canada include BC Hydro Water Use Plans, Watershed Fish Sustainability Plans, Sub-regional Strategic plans, Habitat protection and restoration plans, Water management plans and Watershed Restoration Plans.

Watershed plans	Number of Plans Completed
Canada	
British Columbia	146
Yukon	13
United States	
Alaska	43
Idaho	9
Oregon	540
Washington	208
Pacific Coast Tribes	113
Columbia River Tribes	13

Watershed Plans, Sub-Basin Plans and Assessment Case Studies

Englishman River Watershed Recovery Plan, British Columbia

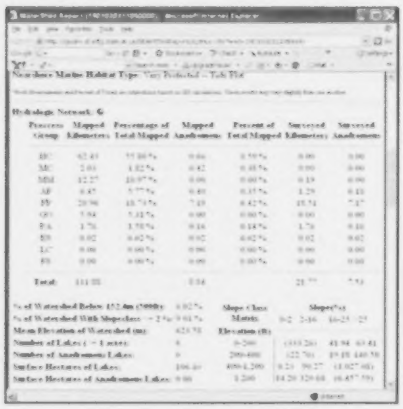
The alarming decline of fish stocks, especially steelhead and coho in the Englishman River and its sub-basins prompted the initiation of the Englishman River Watershed Recovery Plan in 2001. Diking, agriculture and intensive logging early in the 20th century resulted in long-term damage that required strategic intervention to turn around. Contributions came from the Pacific Salmon Commission, Pacific Salmon Foundation, the BC Conservation Foundation, Nature Trust of BC, BC Fisheries, DFO, the Regional District of Nanaimo, the Community Fisheries
Development Centre, Island Timberlands, the Mid Vancouver Island Habitat Enhancement Society (MVIHES), Errington Farmers and local stewardship groups and volunteers to develop and implement the plan.

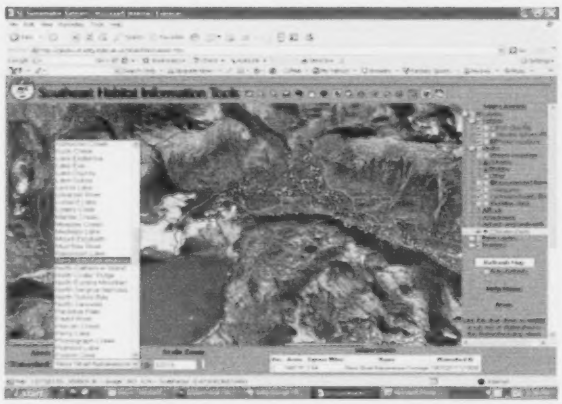
Low summer flows, high sedimentation, bank erosion, a lack of juvenile rearing habitat and poor water quality were identified as primary factors contributing to fish population declines. A watershed profile was developed describing the current condition of the Englishman River watershed and its fish stocks, identifying objectives, targets and strategies to guide recovery, and establishing a monitoring and assessment framework. The development of this plan included community groups, stakeholders, fisheries experts, First Nations and the public. The recovery plan identified improving water flows, securing and treating the riparian corridor, and stabilizing banks and chronic sediment sources as priorities. It also includes a significant community outreach component through events, public education programs, and the local media which has contributed to the success of their community water conservation program, Salmon Friendly Lawn Program, and Automotive/Marine Business Stewardship Program.
Physical works on these priorities were initiated in 2003 and monitored since that time. Coho production has increased and has almost reached the targets set in the Recovery Plan and development of an additional side channel is expected to increase production by a further 50%.

Developing a Web-Based System for Habitat Assessment and Salmon Resource Information, Alaska State

The State of Alaska is developing a web-based system to improve the ability to manage, retrieve and utilize important information necessary for sustaining Southeast Alaska salmon resources. With over 5,600 documented salmon streams in Southeast Alaska, the system will facilitate compilation of, and access to, important annual salmon resource and habitat information gathered through more than 30 datasets from 10 federal, state, local and tribal entities. Alaska Department of Fish and Game staff currently has access to the developing system through local intranets, and the system will be made available to other agencies and entities across the public internet by May 2008 (www.adfg.state.ak.us).

Key information related to Southeast Alaska's abundant salmon resources that is incorporated in the system includes: salmon escapement information for managed stocks; catch reporting; upland and nearshore marine habitat distribution and condition; past land management activities; and location of stream crossing structures and evaluation of their fish passage status. Online reports and data download capabilities will be useful for watershed planning, project or activity permitting, and for prioritization of future restoration activities.





2.7 Salmon Research, Monitoring, and Evaluation Projects

Salmon research, monitoring, and evaluation projects include the conduct of projects to: 1) assess watershed health and salmon status; 2) monitor and evaluate projects; 3) validate the effectiveness of protection and restoration projects; and 4) implement data requirements of the 1999 Pacific Salmon Treaty agreement. More specifically this group includes fish habitat inventory and mapping, assessment and planning of restoration activities, overview assessments of watersheds, sediment source surveys, routine and intensive monitoring, effectiveness monitoring and evaluation.

Research, Monitoring, and Evaluation Projects	Number of Projects
Canada	
British Columbia	1,674
Yukon	31
United States	
Alaska	206
Idaho	8
Oregon	223
Washington	24
Pacific Coast Tribes	149
Columbia River Tribes	41

Intensively Monitored Watershed Project, Washington State

The Intensively Monitored Watershed (IMW) project is a joint effort of the Washington Departments of Fish and Wildlife and Ecology, NOAA Fisheries, EPA, Lower Elwha Klallam Tribe and Weyerhaeuser Company and is financially supported by the Washington Salmon Recovery Funding Board.

The premise of the IMW project is that the complex relationships controlling salmon response to habitat conditions can best be understood by concentrating monitoring and research efforts at a few locations. Focusing efforts on a few locations allows enough data on physical and biological attributes of systems to be collected to allow the detection of the effects of restoration treatments on salmon production. The IMW cooperators have begun collecting water quantity, water quality, habitat, summer juvenile fish abundance, and smolt production data and are identifying specific restoration actions for each IMW treatment watershed. IMWs are an efficient method of achieving the sampling intensity necessary to detect the response of salmon to a set of restoration actions.

The IMW project compares changes in salmon production among experimental treatment (restoration) and control (no restoration) watersheds. The IMW watersheds were selected to provide meaningful comparison. There are three IMW watershed complexes (sets of control and treatment watersheds) that differ in physical characteristics, land use patterns, climate and salmon relative abundance. Differences among watershed complexes enhances the ability to generalize results to other watersheds. Differences among watersheds and complexes also provide opportunities to address a range of factors that contribute to habitat degradation. The IMWs in western Washington focus on coho salmon, and steelhead and cutthroat trout.
The three watershed complexes are the Strait of Juan de Fuca, Hood Canal, and the Lower Columbia. The Strait of Juan de Fuca complex consists of three watersheds: West Twin River, East Twin River, and Deep Creek. The Hood Canal complex consists of four watersheds: Stavis Creek, Big Beef Creek, Seabeck Creek, and Little Anderson Creek. The Lower Columbia complex consists of three watersheds: Mill Creek, Abernathy Creek, and Germany Creek. (http://wdfw.wa.gov/hab/imw/index.htm)

3. Key Regulatory Tools by Jurisdiction

Restoring damaged salmon habitats is important to improving salmon production. Equally important is the management of salmon habitats, including newly restored habitats, to avoid damaging or diminishing their ability to support healthy salmon populations. Therefore, a brief summary highlighting key legislation, policies and initiatives to manage salmon habitats in each jurisdiction is provided. Particular emphasis was given to those initiatives that came into effect since 1999.

Canada

In Canada the federal government has jurisdiction over all seacoast and inland fisheries. However, responsibility for non-salmon freshwater fisheries have been delegated to the Province of British Columbia and the Yukon Territory. The federal *Fisheries Act* which is considered one the strongest environmental Acts in the country includes provisions for the conservation and protection of fish habitat and is guided by the Policy for the Management of Fish Habitat whose objective is achieving a net gain of fish habitat. The Province of B.C. and Yukon Territory have constitutional authority to regulate land and water development activities such as forestry, agriculture, mining, and water allocation which affect fish habitat, and they have enacted specific legislation to regulate these activities. While the federal government has the fish habitat protection mandate, BC and the Yukon also have responsibilities in the management of freshwater fish habitats and conduct this in cooperation with the federal government. The *Canadian Environmental Assessment Act,* the *British Columbia Environmental Assessment Act* and *the Yukon Environmental and Socio-economic Assessment Act* are similar and harmonized pieces of environmental legislation that address the effects of specific development projects on the environment. The federal Species at Risk Act provides for the recovery of wildlife species, including fish that are extirpated, endangered or threatened by human activities. In 2005, the Minister of Fisheries and Oceans introduced the Wild Salmon Policy which will guide Canada's actions to restore and maintain healthy and diverse salmon populations and their habitats for the benefit and enjoyment of the people of Canada in perpetuity.

United States

In response to numerous petitions received in the 1990's from various groups to list particular stocks or population groups of salmon for protection under the Endangered Species Act (ESA), the National Marine Fisheries Service (NMFS) began a series of comprehensive status reviews of salmon and steelhead throughout Washington, Oregon, Idaho, and California. An initial step in this effort involved identifying the specific groupings of Pacific salmon and steelhead that qualify for listing under the statutory language of the ESA, which NMFS defined as "Evolutionarily Significant Units" (ESUs). A total of 52 ESUs were identified in the United States south of the border with Canada. As a result of comprehensive reviews of the biological status of each of the ESUs, twenty-seven eventually were listed as endangered or threatened species under the ESA. During the comprehensive status reviews, it was estimated that hundreds of historic populations in this region had already gone extinct.

The formal listing of salmon and steelhead species under the ESA has a number of very significant consequences. All actions carried out, authorized, or funded by the Federal government that can affect listed salmon or steelhead must now consult with NMFS per section 7 of the ESA to ensure that such actions do not affect the listed species or their critical habitat to the extent that it would jeopardize its continued existence. These "section 7 consultations" have had a dramatic effect on many actions that affect listed species, including but not limited to fishery harvests, hatchery practices, habitat actions and the operation of hydropower facilities throughout the regions.

In addition to its consultation responsibilities under section 7, NMFS is charged under section 4 with the development of recovery plans to improve the status of the listed species to the extent that protections of the ESA are no longer necessary. To discharge this latter responsibility, NMFS advocated and promoted the development of locally led processes to develop comprehensive recovery plans for each of the listed species. NMFS-led regional Technical Recovery Teams were established to provide specific guidance to recovery planners on what it would take for each listed ESU to become viable. These locally derived recovery plans are then submitted to NMFS, who modifies them as may be necessary to meet the specific

requirements of the ESA. Additional information on salmon recovery planning can be found at the NMFS Northwest Region's salmon recovery web site http://www.nwr.noaa.gov/.

Largely in response to the ESA listings of salmon, the U.S. Congress established and has annually funded the Pacific Coastal Salmon Recovery Fund (PCSRF) to support recovery planning and implementation efforts. Many of the projects listed in this report were funded by the PCSRF.

State of Washington

In 1999, Washington State published its Statewide Strategy to Recover Salmon – ***Extinction is Not an Option***. The Strategy included a new approach to forestry management now called "Forests & Fish". The Forests & Fish law was the foundation for new rules (2001) governing forest practices that improve water quality and habitat for aquatic species, including salmon.

Washington's Growth Management Act requires counties and cities to ensure that fish and wildlife habitat conservation areas are protected and that special consideration is given to preserving or enhancing anadromous fisheries. In 2003, Washington updated its Shoreline Management Act guidelines. The new rules establish a "No Net Loss" standard for counties and cities that regulate development along larger streams, lakes and marine waters. In 2007, Washington issued municipal stormwater permits that require the regulation of stormwater runoff from 17 counties and 105 cities.

Since 1999, six of the state's salmon recovery regions have developed recovery plans that have been endorsed by the federal government. The recovery plans are used to guide PCSRF restoration funding decisions. In 2007, Washington statutorily created the Puget Sound Partnership, a new state agency whose sole responsibility is to oversee restoration of the environmental health of Puget Sound by the year 2020.

State of Oregon

In 1999, Oregon created the Independent Multidisciplinary Science Team to provide scientific analysis and evaluation of state actions and policies under the ***Oregon Plan for Salmon and Watersheds (Oregon Plan)***. In addition, the Oregon Watershed Enhancement Board (OWEB) was created and charged with working toward watershed restoration through investments, partnerships, and education. OWEB's programs support Oregon's efforts to restore salmon runs, improve water quality, and strengthen ecosystems that are critical to healthy watersheds and sustainable communities. A 2006 Oregon Conservation Strategy is the state's first overarching strategy for conserving fish and wildlife and their habitats, complementing and supporting the Oregon Plan.

The State Board of Forestry, in 2001, approved final forest management plans for state forests in northwest and southwest Oregon. These plans strive to, among other goals, save existing critical habitat, promote habitat for native species, protect and maintain streams and lands within riparian areas for habitat and water quality, and improve roads to enhance fish passage. The State adopted the concepts of "stewardship agreements" which facilitate and provide incentives for landowners to self-regulate to meet or exceed regulatory requirements and achieve conservation goals.

The State of Oregon completed a Native Fish Conservation Policy in 2002 to ensure the conservation and recovery of native fish. The Policy is implemented through the development of conservation plans, with the goals of preventing the serious depletion of native fish; maintaining and restoring naturally produced fish to provide substantial ecological, economic, and cultural benefits to the citizens of Oregon; and, fostering and sustaining opportunities for fisheries consistent with the conservation of naturally produced fish and responsible use of hatcheries. The Coast Coho Conservation Plan, adopted in 2007, provides for a multi-agency effort to restore critical habitat for coast coho. Recovery Plans are being developed in Oregon for ESA listed fish in five domains and will include measures to protect, restore and conserve habitats.

State of Alaska

The State of Alaska's constitution mandates that "fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed and maintained on the sustained yield principle." To assure the adequate protection and management of Alaska's fisheries resources, the state has statutes and regulations for the assurance of water quality (Department of Environmental Conservation), water quantity, fish passage and habitat protection (Department of Natural Resources), and sustainable fisheries management (Department of Fish and Game). Alaska's water regulations are recognized as some of the most stringent in the United States, and Alaska's abundance based salmon management program that provides for timely in-season management actions is highly regarded world-wide. In 2002, the State adopted in regulation a Sustainable Salmon Fisheries Policy that provides additional guidance for long-term sustainability of salmon and salmon habitat. There are currently no salmon stocks in Alaska that are listed as threatened or endangered under the federal Endangered Species Act.

4. Evaluating Progress

As investments in salmon conservation and recovery efforts proceed, the importance of evaluating the effectiveness of investments and making strategic adjustments increases. Successful feedback mechanisms require the collection of data appropriate to the direct evaluation of effectiveness, benchmarks that reflect the desired progress toward goals, and decision processes that anticipate transparent evaluation and rely on it to make progress.

Overall, evaluations of how restoration activities have enhanced salmon populations are in their early stages. Using salmon populations as a measure of success of habitat improvements is complicated by the multitudes of different factors that influence those population returns (e.g. fishing pressure, ocean survival for adults, and stream flows, weather, riparian disturbance for juveniles in natal streams). Studies designed to address population level response of restoration actions need to "account" for these other factors before they can effectively attribute changes in fish populations to purposeful restoration actions. These types of studies are best done over multiple years, in paired treated (restored) and control basins and when they can include both before and after the restoration sampling of juvenile and adult survival and habitat change. These studies are often expensive and thus are generally limited to a few basins as opposed to all basins where restoration actions are occurring. Effectiveness monitoring of restoration actions outside of these basin-wide studies provide local level response of fish but may not provide "population level" responses. In addition, the costs of monitoring these local level responses are sometimes as expensive as the restoration action itself.

In the United States, tools are being developed at the federal, state, and regional level to track and report short term and long-term performance. **Appendix A** provides information on the evaluating and reporting mechanisms developed at the federal and state level. In Canada some evaluations of the effectiveness of specific types of restoration activities have recently been undertaken with the support of the Southern Endowment Fund. These included an evaluation of the effectiveness of streambank restoration and an evaluation of the effectiveness of engineered off-channel habitats for coho salmon. In association with evaluating benefits of restoration activities to fish production, more indirect benefits to fish habitats resulting from the influence of restoration works on landowner behaviour was also explored.

APPENDIX A
Evaluation and Reporting Mechanisms

In the United States, in response to Congressional and Office of Management and Budget (OMB) direction, NMFS has worked with the PCSRF grantees over the last several years to define performance indicators to measure progress toward PCSRF goals. The major goals against which PCSRF performance can be measured are:

1. Enhance the availability and quality of salmon and steelhead habitat;
2. Improve the status of ESA-listed salmon and steelhead;
3. Address habitat limiting factors for ESA-listed salmon and steelhead;
4. Improve management practices to maintain healthy salmon populations and prevent decline of ESA-listed salmon; and
5. Ensure overall sustainability of naturally spawning Pacific salmon and steelhead.

Additional information on the *Pacific Coastal Salmon Recovery Fund Performance Goals, Measures and Reporting Framework* can be found at: http://www.nwr.noaa.gov/salmon-Recovery-Planning/PCSRF/upload/PCSRF-Perf-Framework.pdf

Progress toward PCSRF goals is reported annually in a NOAA Report to Congress. Previous and current reports can be obtained at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm.

State and Tribal Mechanisms

The following mechanisms are in place to evaluate and report status of habitat and performance of habitat restoration and salmon recovery:

Northwest Indian Fish Commission: State of Our Watersheds Report on the status of salmon habitat in the region. The report compiles decades of data collected by tribes, and state and federal agencies, painting a picture of watersheds across western Washington.
http://www.nwifc.org/watersheds/index.asp

Columbia Fish and Wildlife Authority: Status of Fish and Wildlife Resources in the Columbia River Basin report will present data about current status of subbasins within the Columbia River Basin. It will provide links to historical abundance data for focal species in each subbasin, geographic data representing species distribution, population status, Endangered Species Act status, and species limiting factors as well as present projects currently in place to help fish and wildlife. www.cbfwa.org/sotr

Oregon produces "The Oregon Plan for Salmon and Watersheds Biennial Report" providing an update on the accomplishments and efforts to improve and protect clean water and recover and maintain healthy populations of fish and wildlife. www.oregon.gov/OWEB The Oregon Watershed Enhancement Board (OWEB) uses the following databases to summarize restoration projects:

The Oregon Watershed Restoration Inventory (OWRI) is the primary statewide database for watershed restoration project information voluntarily submitted by restoration practitioners. The database includes completed projects funded by private landowners as well as projects funded with public monies such as OWEB grants. http://www.oregon.gov/OWEB/MONITOR/OWRI.shtml

The Federal Interagency Restoration Database (IRDA) is jointly administered by the Bureau of Land Management and US Forest Service. The database represents completed projects implemented on federal land and/or funded by Title II. http://www.reo.gov/restoration/

In Oregon, OWEB's Oregon Plan for Salmon and Watersheds Monitoring Strategy provides direction to help integrate Oregon Plan programs and monitoring with region-wide watershed enhancement and salmon recovery efforts. The Oregon Department of Fish and Wildlife's Oregon Plan Monitoring for Coastal Basins Program comprises a number of efforts that generate basic information on salmon populations and conditions across large geographic areas of the coast. Activities include juvenile salmon population census, stream habitat assessment, salmonid life cycle monitoring via smolt trapping, and stream health monitoring via biotic index measurement. For information of the above publications use the following links: http://www.oregon.gov/OWEB/MONITOR/monitor_reports.shtml http://www.oregon.gov/OWEB/docs/pubs/MonitoringStrategy.pdf http://oregonstate.edu/dept/ODFW/freshwater/inventory/orplan/overview.htm

Washington's Governor's Salmon Recovery Office produces a biennial State of the Salmon report tracking and reporting progress in salmon recovery at the watershed, regional and statewide scale. High-level indicators are tracked and reported: including fish population status, trends in juvenile production, water quality in watersheds, fish passage barriers corrected and stream miles opened, acre-feet of water restored to streams, compliance of fisheries to ESA harvest goals, salmon recovery plan status, hatchery management plans meeting ESA, average compliance rate of salmon and steelhead fishers, funding, volunteer hours, salmon friendliness of hydroelectric projects. To review the biennial report use: http://www.governor.wa.gov/gsro/publications/sosreport/

Washington Governor's Forum on Monitoring Salmon Recovery and Watershed Health (FORUM) was created in 2004 to coordinate monitoring consistent with the *Comprehensive Monitoring Strategy and Action Plan for Watershed Health and Salmon Recovery (CMS).* The FORUM developed a comprehensive monitoring strategy for tracking future conditions of Washington's natural resources and determining, as part of the adaptive management process, whether management actions to restore habitat and fish populations have been effective from physical, biological, and economic perspectives. The FORUM identified a major missing element for Washington is a monitoring program to determine status and trends in habitat using a probalilistic sampling design coupled with remote sensing. The forum has proposed a program to the State Legislature that will provide a measure of overall habitat status that takes into consideration ongoing habitat losses due to urbanization and other causes as well as habitat gains due to restoration actions in order to measure relative progress toward the goal of improving freshwater and estuarine habitat basin wide and throughout an ESU. http://www.rco.wa.gov/documents/srfb/Monitoring/Executive_Report_final.pdf

Washington's Intensively Monitored Watersheds (IMWs) discussed in a case study are an example of a basin-wide monitoring and evaluation approach. http://wdfw.wa.gov/hab/imw/index.htm